

Application Serial No. 10/047,317; filed January 14, 2002
Response to Office Action of February 10, 2005

AMENDMENTS TO THE CLAIMS:

The listing of claims will replace all prior versions, and listings of claims in the application:

LISTING OF THE CLAIMS

1. (Currently Amended) A vapor decontamination system for decontaminating a defined region, the system comprising:

at least a first duct along which a first carrier gas flow is passes passed to the defined region;

a flash vaporizer for vaporizing a liquid which includes an antimicrobial compound into vapor;

a second carrier gas flow connected with the flash vaporizer, an outlet of the flash vaporizer being connected to the duct for supplying the second carrier gas flow and vapor into the duct for absorption into the first carrier gas flow passing through the duct at a mixing zone downstream of the flash vaporizer; and

a means for introducing the liquid from a source to the flash vaporizer.

2. (Original) The system as set forth in claim 1 wherein the antimicrobial compound includes hydrogen peroxide and the flash vaporizer includes:

a metal block;

at least one heater for heating and maintaining the metal block at or above a vaporization temperature of hydrogen peroxide and below a hydrogen peroxide disassociation temperature; and

a passage extending through the block from an inlet to the outlet.

3. (Original) The system as set forth in claim 2 wherein the passage expands in cross section between the inlet and the outlet.

4. (Original) The system as set forth in claim 3, wherein the passage turns at least 180° between the inlet and the outlet.

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5. (Original) The system as set forth in claim 4 wherein the passage includes at least two turns of approximately 90° and a wall therebetween, such that the liquid in the passage strikes the wall, thereby increasing a vaporization rate of the liquid antimicrobial compound.

6. (Original) The system as set forth in claim 4 wherein the passage includes:

a plurality of interconnected bores extending back and forth through the block between the inlet and the outlet.

7. (Currently Amended) The system as set forth in claim [[1]] 12 further including:

a microbe trapping filter between the duct and the defined region.

8. (Currently Amended) The system as set forth in claim 1 further including:
a heater and a dehumidifier connected with the duct upstream from the injection mixing zone.

9. (Currently Amended) The system as set forth in claim 8 wherein the duct includes:

an inlet upstream of the heater and the dryer dehumidifier connected with the defined region such that the first carrier gas flow is circulated from the duct inlet, through the heater and dryer dehumidifier, through the injection mixing zone, and through a duct outlet into the defined region.

10. (Original) The system as set forth in claim 9 further including:
microbe trapping filters disposed adjacent the duct inlet and the duct outlet.

11. (Currently Amended) The system as set forth in claim 9 wherein the antimicrobial compound includes hydrogen peroxide and further including:

a hydrogen peroxide destroyer for decomposing hydrogen peroxide vapor

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into water vapor and oxygen, the destroyer being disposed upstream from the ~~dryer dehumidifier~~.

12. (Currently Amended) ~~The A decontamination system as set forth in claim 1 further including for decontaminating a defined region, the system comprising:~~

~~at least a first duct along which a first carrier gas flow is passed to the defined region;~~

~~a heated block and fluid passage for dispersing a liquid which includes an antimicrobial compound in a second carrier gas flow, the heated block having an inlet and an outlet, the outlet of the block being connected to the duct for supplying the second carrier gas flow with the dispersed liquid to a mixing zone in the duct for absorption into the first carrier gas flow passing through the duct; and~~

~~a source of the carrier gas flow connected with the flash vaporizer block inlet for creating a positive pressure differential from the flash vaporizer heated block to the absorption mixing zone.~~

13. (Original) The system as set forth in claim 1 further including:

at least one additional flash vaporizer and means for introducing liquid connected with the duct.

14. (Original) The system as set forth in claim 1 further including:

at least a second duct; and,

at least a second flash vaporizer and means for introducing liquid connected with the second duct.

15. (Currently Amended) The system as set forth in claim 1 further including:

a first plurality of monitors connected with the duct upstream of the ~~injection~~ mixing zone;

a second plurality of monitors disposed in the defined region; and

a controller connected to the monitors for controlling the means for introducing liquid in accordance with monitored conditions in the duct and in the defined area region.

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16. (Currently Amended) The system as set forth in claim [[1]] 12 further including:

fans disposed in the defined region for circulating vapor into partially occluded subregions.

17. (Currently Amended) The system as set forth in claim [[1]] 12 wherein the means for introducing the liquid includes further including a metering pump which meters the liquid into the passage of the block.

18. (Currently Amended) A method of decontaminating a defined area, the method comprising:

pumping a carrier gas through a duct to the defined region;
in a passage different from the duct, converting a liquid into an antimicrobial dispersion;

injecting an the formed antimicrobial vapor dispersion into the duct at a mixing zone defined in the duct upstream of the defined region to entrain the antimicrobial dispersion in the carrier gas.

19. (Currently Amended) The method as set forth in claim 18 wherein a carrier gas flow through the duct is at the a rate of at least 20 cubic meters per minute and the defined area region is an enclosure of at least 10,000 cubic meters.

20. (Currently Amended) The method as set forth in claim 18 wherein the antimicrobial vapor dispersion includes vapor phase hydrogen peroxide and further including:

heating a block which has an internal passage to a temperature sufficient to vaporize the hydrogen peroxide but which temperature is lower than a temperature which disassociates hydrogen peroxide;

passing hydrogen peroxide into the passage through the block to vaporize the hydrogen peroxide;

passing the hydrogen peroxide vapor from the passage into the mixing

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zone; and

mixing the hydrogen peroxide vapor into the carrier gas flow.

21. (Original) The method as set forth in claim 20 further including:
blowing carrier gas through the passage with the hydrogen peroxide to
create a positive pressure differential between the passage and the duct.
22. (Original) The method as set forth in claim 20 further including heating
and drying the carrier gas in the duct upstream of the mixing zone.
23. (Currently Amended) The method as set forth in claim 18 further including:
pulling carrier gas with antimicrobial vapor dispersion from the enclosed
area through a microbe-trapping filter; and
drying and heating the carrier gas and passing the dried, heated carrier
gas to the duct upstream of the mixing zone.
24. (Original) The method as set forth in claim 23 further including anti-
microbially filtering carrier gas between the duct and the defined area.
25. (Original) The method as set forth in claim 18 wherein the defined region
is a large room and the duct includes existing HVAC duct work.
26. (Currently Amended) The method as set forth in claim 25 further including:
supplying carrier gas through a plurality of ducts into the room; and
injecting hydrogen peroxide vapor dispersion into the carrier gas in each
of the ducts.
27. (Currently Amended) The method as set forth in claim 18 further including:
directing antimicrobial vapor dispersion in the defined region against at
least one surface to be decontaminated.
28. (Currently Amended) The method as set forth in claim 18 further including:

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monitoring concentration of the antimicrobial compound in the vapor dispersion in the room and carrier gas conditions in the duct upstream of the injection mixing zone, and

controlling a rate at which the vapor antimicrobial dispersion is supplied to the duct in accordance therewith.

29. (Currently Amended) The method as set forth in claim 18 further including:

monitoring a concentration of the antimicrobial compound in the vapor dispersion in the defined area region until the concentration reaches a preselected level; and

holding the vapor dispersion in the defined area region without further addition of vapor antimicrobial dispersion for a period of time.

30. (Currently Amended) The method as set forth in claim 18 further including:

heating a block above a vaporization temperature of a peroxy compound;
and

metering the peroxy compound in liquid form into an internal bore in the block to vaporize the peroxy compound.

31. (Currently Amended) The method as set forth in claim 30 18 further including:

entraining the a liquid peroxy compound into a controlled air flow upstream from the block in the passage.

32. (Currently Amended) The method as set forth in claim 31 wherein the internal bore passage turns and further including:

propelling peroxy compound droplets into bore heated passage surfaces at turns in the internal bore passage.

33. (Currently amended) A method of decontaminating an enclosure comprising:

providing a first carrier gas stream and a second carrier gas stream, the

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first stream having a lower flow rate than the second stream[[:]];

introducing the first stream to a passage, the passage having at least one bend;

introducing a flow of an aqueous solution of a peroxy compound into the passage upstream of the bend, the peroxy compound mixing with the first stream, walls of the passage being heated to vaporize the aqueous solution; and

mixing the vaporized aqueous solution and first carrier gas stream with the second carrier gas stream in a mixing zone downstream of the passage and transporting the mixed vaporized aqueous solution and first and second carrier gas streams to the enclosure.